Course code	Course Name	L-T-P Credits	Year of Introduction
CS484	COMPUTER GRAPHICS	3-0-0-3	2016

Pre-requisite: A course on C or C++ in the B-Tech level with emphasis on pointers and functions.

Course Objectives

- To introduce concepts of graphics input and display devices.
- To introduce and discuss line and circle drawing algorithms.
- To introduce 2D and 3D transformations and projections.

Syllabus

Basic Concepts in Computer Graphics. Input devices. Display devices. Line/Circle Drawing Algorithms. Solid area scan-conversion. Polygon filling. Two dimensional transformations. Windowing, clipping. 3D Graphics, 3D transformations. Projections – Parallel, Perspective. Hidden Line Elimination Algorithms.

Expected Outcome:

The Student will be able to:-

i. compare various graphics devices
ii. analyze and implement algorithms for line drawing, circle drawing and polygon filling
iii. apply geometrical transformation on 2D and 3D objects
iv. analyze and implement algorithms for clipping
v. apply various projection techniques on 3D objects
vi. summarize visible surface detection methods

Text Books:

1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI, 1996
2. William M. Newman and Robert F. Sproull, Principles of Interactive Computer Graphics, McGraw Hill, 1979
3. Zhigang Xiang and Roy Plastock , Computer Graphics (Schaum's outline Series), 1986.

References

1. David F. Rogers , Procedural Elements for Computer Graphics, McGraw Hill, 2001
2. M. Sonka, V. Hlavac, and R. Boyle, Image Processing, Analysis, and Machine Vision, Thomson India Edition, 2007.
3. Rafael C. Gonzalez and Richard E.Woods , Digital Image Processing, Pearson, 2017 .

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	Basic concepts in Computer Graphics – Types of Graphic Devices – Interactive Graphic inputs – Raster Scan and Random Scan Displays.	6	15%
II	Line Drawing Algorithm- DDA, Bresenham's algorithm – Circle Generation Algorithms –Mid point circle algorithm, Bresenham's algorithm-	7	15%
FIRST INTERNAL EXAM			

III	Scan Conversion-frame buffers – solid area scan conversion – polygon filling algorithms Two dimensional transformations. Homogeneous coordinate systems – matrix formulation and concatenation of transformations.	7	15%
IV	Windowing concepts –Window to Viewport Transformation- Two dimensional clipping-Line clipping – Cohen Sutherland, Midpoint Subdivision algorithm	6	15%
SECOND INTERNAL EXAM			
V	Polygon clipping- Sutherland Hodgeman algorithm, Weiler-Atherton algorithm, Three dimensional object representation- Polygon surfaces, Quadric surfaces – Basic 3D transformations	7	20%
VI	Projections – Parallel and perspective projections – vanishing points. Visible surface detection methods– Back face removal- Z-Buffer algorithm, A-buffer algorithm, Depth-sorting method, Scan line algorithm.	7	20%
END SEMESTER EXAM			

Question Paper Pattern (End semester exam)

1. There will be ***FOUR*** parts in the question paper – **A, B, C, D**
2. **Part A**
   a. **Total marks : 40**
   b. ***TEN*** questions, each have **4 marks**, covering **all the SIX modules** (***THREE*** questions from **modules I & II**; ***THREE*** questions from **modules III & IV**; ***FOUR*** questions from **modules V & VI**).
   All the TEN questions have to be answered.
3. **Part B**
   a. **Total marks : 18**
   b. ***THREE*** questions, each having **9 marks**. One question is from **module I**; one question is from **module II**; one question ***uniformly*** covers **modules I & II**.
   c. ***Any TWO*** questions have to be answered.
   d. Each question can have ***maximum THREE*** subparts.
4. **Part C**
   a. **Total marks : 18**
   b. ***THREE*** questions, each having **9 marks**. One question is from **module III**; one question is from **module IV**; one question ***uniformly*** covers **modules III & IV**.
   c. ***Any TWO*** questions have to be answered.
   d. Each question can have ***maximum THREE*** subparts.
5. **Part D**
   a. **Total marks : 24**
   b. ***THREE*** questions, each having **12 marks**. One question is from **module V**; one question is from **module VI**; one question ***uniformly*** covers **modules V & VI**.
   c. ***Any TWO*** questions have to be answered.
   d. Each question can have ***maximum THREE*** subparts.
6. There will be ***AT LEAST* 50%** analytical/numerical questions in all possible combinations of question choices.